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Original Article

Dentistry Section

Comparison of Dimensional Stability of Casts Obtained from Elastomeric Impression Materials with Different Impression Techniques at Different Time Intervals of Cast Pouring after Subjecting them to Disinfection Protocols: An In-vitro Study

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ABSTRACT

Introduction: The success of fixed prosthodontic treatment depends on many steps among which impression making is critical step. During impression making, the impression material is exposed to infected blood and saliva which is the potential source for cross contamination especially to clinicians and laboratory workers. When an impression is subjected to disinfection there may be change in dimensional accuracy which results in faulty prosthesis.

Aim: To evaluate the dimensional stability of two elastomeric impression materials namely Vinyl Poly Siloxane (VPS) and Vinyl Poly Ether Siloxane (VPES) after subjecting them to chemical disinfection and making models through multiple pours at varying time intervals.

Materials and Methods: The present in-vitro study was conducted in KIMS Dental College and St. Joseph Dental College, Andhra Pradesh, India, over a period of 5 months from August 2023 to December 2023. A total of 480 samples were prepared by pouring the casts with VPS and VPES materials using one stage and two stage impression techniques and then the impressions were subjected to korsolex and surfasept disinfectants. After disinfection the casts were poured at time interval of one hour, 24 hours, one and two weeks. Stereomicroscope was used to measure the diameter and height of die and digital calipers were employed to measure the inter distance between the dies. Four-way factorial Analysis of Variance (ANOVA) and pair wise comparisons were done using Least Significant Difference (LSD) Bonferroni test to analyse the data. The level of significance was set at $p<0.05$.

Results: Significant differences were noticed ($p=0.001$) between VPS (7.99±0.05), and VPES (7.95±0.11) where the mean die height was significantly lower in VPS and VPES. Method of disinfection yielded an F ratio of 8.019 ($p=0.001$), indicating a significant difference between three disinfection protocols. The mean die diameter was significantly lower after Korsolex disinfection.

Conclusion: Disinfection of VPES with korsolex, showed decrease in mean die height when the impressions are made with two step impression technique at two week time interval. When VPS was disinfected with surfasept, the mean values of die diameter are decreased for casts poured at one week time interval.

Keywords: Korsolex, Surfasept, Vinyl poly ether siloxane, Vinyl poly silicone

INTRODUCTION

In the field of prosthodontics, perfect restoration often corresponds to meticulous and precise impression making [1]. Impression making plays a major role because as it transfers the clinical situation to the cast, which must reproduce the oral structures accurately and simulate the occlusion with its antagonist [2]. The accuracy of impression may also be affected by properties of impression material like polymerisation shrinkage, presence of volatile by products, thermal contraction, elastic recovery, bulk of material, tray material, space between tray and tooth preparation [3]. Impression making concept was first introduced during 18th century where painting of the ridges followed by pressing with ivory or bone against the painted surface. Later gutta-percha and bees wax were used to make impressions. In 1940s the first reversible hydrocolloid impression material introduced was alginate followed by elastomeric impression materials in 1950 [4].

Four basic types of elastomeric impression materials currently used in dental profession are poly sulphide, addition silicone, condensation silicone and polyether. From these elastomeric impression materials good results were obtained with less expenditure of time and less discomfort to the patient [5]. Among impression materials addition silicone have best surface details reproduction and elastic recovery [6]. The main disadvantage of addition silicone is due to its hydrophobicity. This is overcome by addition of surfactants [7]. Polyether is very rigid material with hydrophilic properties. The main disadvantage of condensation silicone is poor wetting characteristics and had more shrinkage on setting the material [8]. With the recent advancement in material science invention of newer material VPES which is the combination of hydrophilic properties of polyether and elastic recovery of VPS was possible. The manufacturers claim that VPES material had outstanding dimensional stability even when the impression had unpoured for up to two weeks [9]. The Impressions are made with custom or stock trays which accommodate different consistencies of impression material. The accuracy of impression is also affected by the impression technique used [10]. The different consistencies of impression material allow them to be used in two impression techniques, single step and dual step technique [11].

During impression making saliva, blood, oral fluid come in contact, which contain microorganisms and are responsible for cross infection from set impression to laboratory workers. These microorganisms through the impression causes infectious diseases like Acquired Immunodeficiency Syndrome (AIDS), tuberculosis, herpes, hepatitis and others. These lead to the introduction of guidelines set by American academy of Dental Association

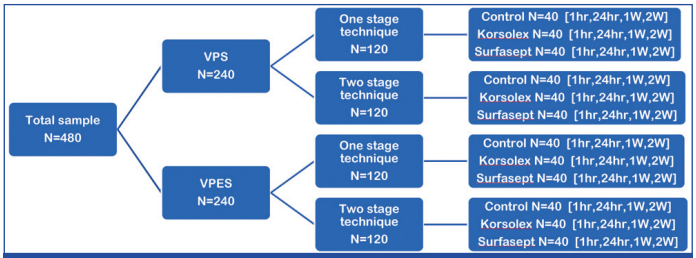
(ADA) and Center for Disease Control (CDC), it suggest that all the surfaces that are splashed by human body fluids should be disinfected with low grade disinfectant [12,13]. The impression material can be disinfected with chemical like glutaraldehyde, sodium hypochlorite, ethanol, propanol, chlorhexidine, alcohol etc., or through physical method like autoclave [14]. After subjecting the impression material to sterilisation, the properties of impression material may alter mainly dimensional accuracy which may have direct effect on prosthetic results. The one of the most important property of elastomeric impression material is dimensional stability [15]. The accuracy of impression with multiple pours is of paramount importance as duplicate casts are required for various laboratory procedures. Delayed pouring results in release of volatile byproduct causing polymerisation shrinkage and thermal contraction. If there is dimensional inaccuracy or change in impression, the resultant prosthesis that had fabricated from the cast showed improper fit of the prosthesis [16]. These need a thorough knowledge in proper usage of dental impression materials to achieve success of the prosthetic therapy.

The aim of this study was to evaluate the dimensional stability of VPS and VPES impression material after pouring of casts at different pour time intervals of one hour, 24 hours, one week and two weeks obtained from two different impression techniques after subjecting them to chemical disinfection. The alternate hypothesis was that type of technique used, chemical disinfectant and multiple pours would impart dimensional accuracy and null hypothesis is parameters not affecting the properties of VPS and VPES impression material.

MATERIALS AND METHODS

This was an in-vitro study conducted in collaboration with KIMS Dental College and Hospital, Amalapuram and St. Joseph Dental College and Hospital, Andhra Pradesh, India. Ethical Review Board for clinical trials (Material protocol no. 013/ KIMS DENTAL/2022). The study was conducted over a period of 5 months from August 2023 to December 2023.

Sample size calculation: The sample size was estimated using G power one software with power of 91% and alpha error at 5%. A total of 480 samples were prepared by pouring the casts with VPS and VPES elastomeric impression materials using one stage and two stage impression techniques and then the impressions were subjected for chemical disinfection. After disinfection the casts were poured at time interval of one hour, 24 hours, one week and two weeks [Table/Fig-1].



[Table/Fig-1]: Sample allocation in different groups.

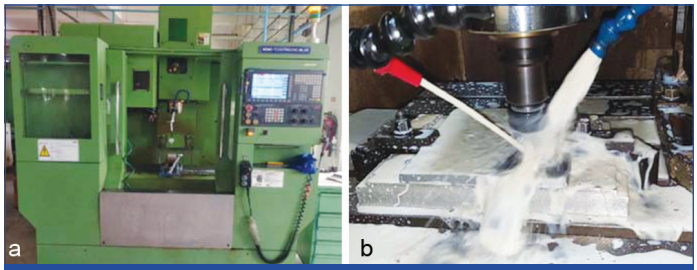
Inclusion criteria: Samples without voids and roughened surfaces.

Exclusion criteria: Samples with voids and roughened surfaces were excluded. Samples with improper mixing of VPS and VPES were excluded.

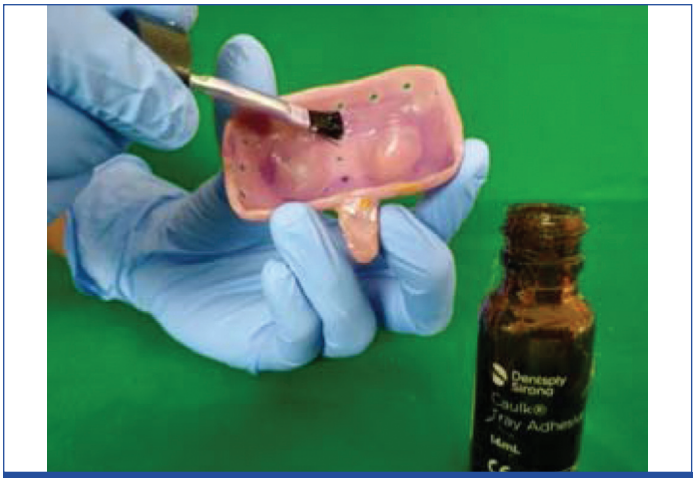
Study procedure

Die preparation: A custom-made aluminum die was made according ADA specification number 19 containing two tapered abutments simulating the prepared teeth. The two abutments were labelled as A and B. The diameter of each abutment was 6.330 mm on the occlusal aspect of the abutment, height was 8.015 mm from the finish line to the occlusal aspect of the abutment and distance between the two abutments was 28.270 mm which was measured from center point of the two abutments [Table/Fig-2] [17]. The degree of taper was 60 for the both abutments simulating ideal tooth preparation. On the occlusal surface, reference grooves of depth 0.5mm were made. This grooves act as reference points to measure Interabutment Distance (IAD). The die was manufactured using a four axis Computerised Numerically Controlled (CNC) milling machine with spindle speed of minimum 30 Revolutions Per Minute (RPM), maximum 8000 RPM with an accuracy of ±5µm and a coolant using Standard Tessellation Language (STL) Format with respective dimensions in Central institute for Tool Design (CITD), manufactured by Ace Micromatic Group, Jyoti CNC Automation Limited, LMW Machine Tool Division, and Yamazaki Mazak India. [Table/Fig-3] An acrylic special tray was fabricated, to provide uniformity of the impression material loading which minimise the shrinkage and there by enhance the dimensional accuracy. This acrylic special tray was fabricated on the custom-made aluminum die. To create space for putty material 6-7 mm thickness of wax sheet was adapted as spacer. Tray material was adapted over the wax spacer and excess material was removed with the BP blade. Then the tray material was placed in light cure unit for 10 minutes. These trays were used for impression making. The acrylic trays were made sure that they were free of oil, grease and other particles as they may contaminate the impression. A total of 40 acrylic trays were fabricated for impression making. The acrylic tray was coated with two to three coats of thin layer of tray adhesive over borders and internal surfaces [Table/Fig-4]. The tray adhesive was dried for two minutes according to manufacturer's instructions. The impressions were made with two elastomers, putty and light body consistency VPS (Group A) n=240 and VPES (Group B) n=240 with two techniques, one stage n=120 and two stage n=120 impression techniques. In one stage impression technique putty consistency base and catalyst were taken in equal proportions and then kneaded into homogenous mass followed by adapting the material into the custom tray and then light body impression material was dispensed with mixing gun over the putty material simultaneously [Table/Fig-5]. In two stage impression technique, putty consistency base and catalyst were taken in equal proportions and then kneaded into homogenous mass followed by loading into the tray along with cellophane sheet of thickness 0.5 mm which act as spacer for light body. Subsequently in the second stage cellophane sheet was removed and light body material was dispensed into the tray with the help of mixing gun [Table/Fig-6]. In

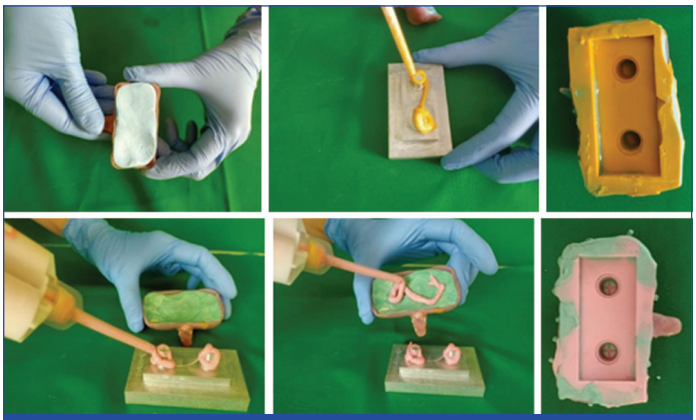
[Table/Fig-2]: Die used for dimensional stability (According to ADA specification no. 19).
The dimensions of die with two abutments are labelled as A and B. The diameter of each abutment is 6.330 mm on the occlusal aspect of the abutment, height is 8.015 mm from the finish line to the occlusal aspect of the abutment and distance between the two abutments is 28.270 mm.



[Table/Fig-3]: a) CNC milling unit; b) Milling of metal die for dimensional stability.



[Table/Fig-4]: Application of tray adhesive.

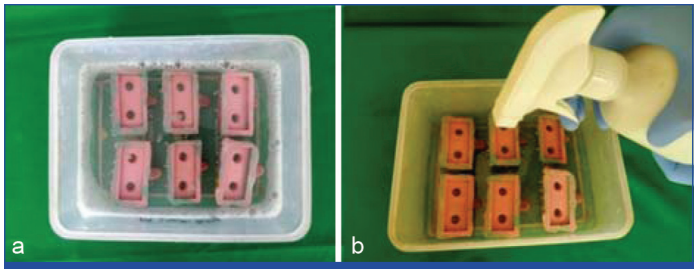


[Table/Fig-5]: One stage impression technique with VPS and VPES.

[Table/Fig-6]: Two stage impression technique with VPS and VPES.

both the techniques, pressure was applied until the tray seats over the base of the die which acts as a stop. The impression material was allowed to set according to manufacturer instructions and then impression is retrieved and washed under tap water to simulate clinical scenario. The korsolex solution (Manufactured by Raman and Weil Pvt. Ltd.,) was prepared by diluting five parts of korsolex solution with 95 parts of clean tap water to get approximately 5% solution. After preparation of chemical disinfection solution, the impressions were subjected to chemical disinfection for 10 minutes. For surfasept group the solution (Manufactured by Septodont Healthcare India Pvt. Ltd.,) was evenly sprayed on the impression and then rinsed, followed by cast pouring [Table/Fig-7] [18]. For control group i.e., the impressions that were not subjected to chemical disinfection, were also poured at intervals of one hour, 24 hours, one week and two weeks to compare with the disinfected impressions.

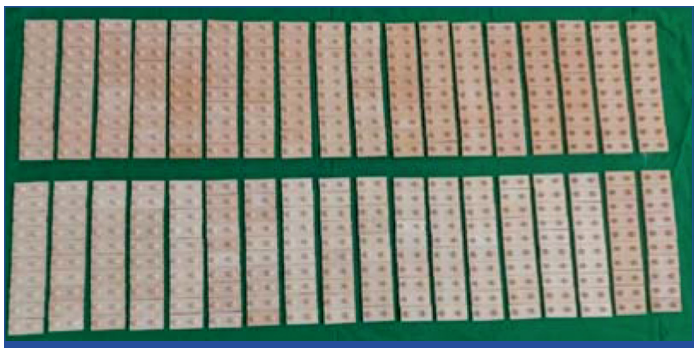
Following the disinfection protocol, the impression was poured with type IV gypsum. The mixed material was loaded into the impression and casts were made using vibrator in order to avoid the voids due to air entrapment. The impression was left for 45 minutes to one



[Table/Fig-7]: Disinfection of samples with korsolex and surfasept.

hour to set according to manufactures instructions and then the casts were retrieved. The resultant casts were inspected for any discrepancies like voids or irregular surfaces and were discarded.

Total 480 casts were obtained from all the groups [Table/Fig-8]. From each resultant cast poured from the impression, three measurements i.e., inter abutment distance, diameter and height were measured. Dimensional stability was evaluated using digital vernier calipers (Manufactured by Balrama Enterprises, Khatoni) capable of measuring accuracy up to ±0.02 mm by measuring the inter abutment distance [Table/Fig-9]. Stereomicroscope is used to measure height and diameter of two abutments by placing the samples in the center of stereomicroscope and digitally draw the lines from occlusal to finish line to measure height and draw the lines occlusally from one end to other end to measure diameter of the sample [Table/Fig-10]. To avoid the discrepancy, two measurements were taken and mean measured value was taken for diameter, height and IAD. All the measurements were carried out by single observer in order to enhance the accuracy. All the mean values were tabulated and data was subjected to statistical analysis.



[Table/Fig-8]: Samples made from VPS and VPES.

[Table/Fig-9]: Digital vernier caliper measuring inter abutment distance.

[Table/Fig-10]: Digital Stereomicroscope measuring diameter and height of the samples.

STATISTICAL ANALYSIS

Data analysis was done using IBM Statistical Package for Social Sciences (SPSS) version 20 software (IBM SPSS, IBM Corp., Armonk, NY, USA). Basic descriptions were presented in the form of mean and standard deviations. Intergroup comparisons were analysed using ANOVA and pairwise comparisons were done using LSD Bonferroni test. Bar charts were used for data presentations. The p-value was considered as significant if the value was ≤0.05.

RESULTS

The main effect for the type of material yielded an F ratio of 20.201 (p=0.001), indicating a significant difference between VPS (7.99±0.05), and VPES (7.95±0.11) [Table/Fig-11]. The mean die height was significantly lower in VPS and VPES (p=0.001) [Table/Fig-12]. The main effect for the type of impression technique yielded an F ratio of 6.483 (p=0.011)), indicating a significant difference between technique 1 (7.98±0.07), and technique 2 (7.96±0.10). The mean die height was significantly lower in technique 1 and technique 2 (p=0.011) [Table/Fig-13]. The main effect for method of disinfection yielded an F ratio of 8.019 (p=0.001), indicating a significant difference between the three disinfection protocols. The mean die diameter was significantly lower after Korsolex disinfection (p=0.001) [Table/Fig-14]. The main effect for the duration of pouring model yielded an F ratio of 7.645 (p=0.001), indicating a significant difference between one hour (7.99±0.06), 24 hours (7.98±0.07), one week (7.97±0.08) and week 2 (7.94±0.12). The mean die height was significantly lower at two weeks when compared with the rest (p=0.001) [Table/Fig-15]. The mean IAD for type of material, impression technique, method of disinfection and pour time showed insignificant values (p=1.000) [Table/Fig-11].

Factors	Sub-factors	n	Mean	Std. deviation	F value	p-value
Material	VPS	240	7.99	0.05	20.201	0.001*
	VPES	240	7.95	0.11		
Technique	Technique 1	240	7.98	0.07	6.483	0.011*
	Technique 2	240	7.96	0.10		
Disinfection	Control	160	7.99	0.04	8.019	0.001*
	Surfasept	160	7.97	0.08		
	Korsolex	160	7.95	0.12		
Pour Time	1 Hour	120	7.99	0.06	7.645	0.001*
	24 Hours	120	7.98	0.07		
	1 Week	120	7.97	0.08		
	2 Weeks	120	7.94	0.12		
Impression material x impression technique					7.236	0.007*
Impression material x method of disinfection					2.788	0.063
Impression material x pour time					0.859	0.462
Impression technique x method of disinfection					3.390	0.035*
Impression technique x pour time					0.002	1.000
Method of disinfection x pour time					0.774	0.591
Impression material x impression technique x method of disinfection					3.973	0.020*
Impression material x impression technique x pour time					0.056	0.982
Impression material x method of disinfection x pour time					0.240	0.963
Impression technique x method of disinfection x pour time					0.076	0.998
Impression material x impression technique x method of disinfection x pour time					0.018	1.000

[Table/Fig-11]: Intergroup comparision of VPS and VPES impression material.
Test applied- Four-way analysis of variance. (P: Probability value; F: Ratio of variances in ANOVA) *p<0.05 (Significant), **p>0.05 (Not Significant).

(I) Impression material	(J) Impression material	Mean difference (I-J)	p-value	95% Confidence Interval for difference	
				Lower Bound	Upper Bound
VPS	VPES	0.034*	0.000*	0.019	0.049
VPES	VPS	-0.034*	0.000*	-0.049	-0.019

[Table/Fig-12]: Pairwise comparision based on material.
Test applied - Bonferroni test *p<0.05 (Significant), **p>0.05 (Not Significant)

(I) Impression technique	(J) Impression technique	Mean difference (I-J)	p-value	95% confidence interval for difference	
				Lower bound	Upper bound
Technique 1	Technique 2	0.019*	0.011*	0.004	0.034
Technique 2	Technique 1	-0.019*	0.011*	-0.034	-0.004

[Table/Fig-13]: Pairwise comparision based on technique.
Test applied - Bonferroni test; *p<0.05 (Significant), **p>0.05 (Not Significant)

(I) Method disinfection	(J) Method disinfection	Mean difference (I-J)	p-value	95% Confidence interval for difference	
				Lower Bound	Upper Bound
Control	Surfasept	0.022	0.053	0.000	0.044
	Korsolex	0.037*	0.001*	0.015	0.059
Surfasept	Control	-0.022	0.053	-0.044	0.000
	Korsolex	0.015	0.331	-0.007	0.037
Korsolex	Control	-0.037*	0.001*	-0.059	-0.015
	Surfasept	-0.015	0.331	-0.037	0.007

[Table/Fig-14]: Pairwise comparision based on disinfectant.
Test applied - Bonferroni test; *p<0.05 (Significant); **p>0.05 (Not Significant)

(I) Pour time	(J) Pour time	Mean difference (I-J)	p-value	95% confidence interval for difference	
				Lower bound	Upper bound
1 hour	24 hours	0.007	1.000	-0.021	0.035
	1 week	0.020	0.341	-0.008	0.049
	2 weeks	0.047*	0.001*	0.019	0.075
24 hours	1 hour	-0.007	1.000	-0.035	0.021
	1 week	0.013	1.000	-0.015	0.042
	2 weeks	0.040*	0.001*	0.012	0.068
1 week	1 hour	-0.020	0.341	-0.049	0.008
	24 hours	-0.013	1.000	-0.042	0.015
	2 weeks	0.027	0.072	-0.001	0.055
2 weeks	1 hour	-0.047*	0.001*	-0.075	-0.019
	24 hours	-0.040*	0.001*	-0.068	-0.012
	1 week	-0.027	0.072	-0.055	0.001

[Table/Fig-15]: Pairwise comparision based on pour time.
Test applied - Bonferroni test; *p<0.05 (Significant), **p>0.05 (Not Significant)

DISCUSSION

The most important step in fixed prosthesis is obtaining an accurate impression of the prepared teeth which further determines the success of treatment [19]. The accuracy of fitting prosthesis depends on several factors such as impression material, impression technique, thickness of the material, type of impression trays used, excessive seating pressure, slow removal of impression from the mouth, stress relaxation and storage time periods [20].

During impression making, the material may directly come in contact with oral fluids, such as blood, saliva and other exudates which may contain pathogenic microorganisms. Through the impression, the infectious diseases like herpes, tuberculosis, AIDS, Hepatitis and others may get transmitted to the laboratory workers and dental technicians [21,22]. In order to prevent this cross-contamination, disinfection of dental impression is mandatory. American Academy of Dental Association (ADA) and Centre for Disease Control (CDC) recommended the disinfection of impression immediately after removal from the mouth with various chemical disinfectants such as glutaraldehyde, iodophors,

phenols and chlorine compounds [23,24]. Addition silicone (VPS) impression material gained high acceptancy among the dentists due to less polymerisation shrinkage, no release of byproducts and excellent elastic recovery. VPES, a novel elastomeric impression material that combines all the advantageous properties of VPS and Polyether (PE), has just entered the commercial market. The manufacturers introduced VPES, as a hybrid of VPS and PE. So, in this study VPS and VPES impression materials were selected. Here, putty and light body VPS and VPES elastomeric impression materials were used to evaluate DS by comparing the discrepancies among the stone casts before and after disinfection with korsolex and surfasept.

In laboratory, sometimes there is need for multiple pouring of an impression at different time intervals. This study was also focused on this aspect by considering different pour time intervals. Dimensional stability was evaluated by making the impressions with VPS and VPES using one stage and two stage impression techniques from the aluminum die which was fabricated according to ADA specification no 19. In the control group impressions made with elastomeric IM (VPS, and VPES) were washed under gentle tap water. In korsolex group the impressions were disinfected with korsolex (5%Glutaraldehyde and 1,6 Dihydroxy 2,5 – Dioxahexane Concentrate) and in surfasept group (70% w/w isopropyl alcohol, 2.50% w/w chlorhexidine gluconate sol) the impressions were disinfected with surfasept. After disinfection then the impressions were poured at time intervals of one hour, 24 hours, one week and two weeks, respectively with type IV gypsum. The dimensional changes in the diameter, height of the abutment and inter abutment distance were measured on the casts.

In the present study, there was increase in mean IAD distance during 2 week time interval. Differences in inter abutment distances was also reported by Johnson GH et al., [25]. This increase in dimensions was due to linear expansion of die material throughout entire bulk of the stone casts. The clinically acceptable linear expansion range is <90µm. It may be partially due to adhesion of impression material towards the tray [26]. This was in accordance with the similar studies done by Pandey A and Mehtra A [27] and Sergio G [17]. The results of present study revealed that there was no dimensional inaccuracy of the casts when poured from both materials up to one week time period. The results of present study were in agreement with study conducted by Johnson GH [25]. Since acrylic trays were typically used to support the impression material, their adjustments should be considered when calculating the dimensional changes of the impressions because they have a tendency to absorb and expand in a humid environment [28,29]. In addition to these findings, the impressions which were poured with type IV gypsum may cause the impression to expand as it sets. Regardless of the type of impression material employed, the impression may undergo uniform expansion all over the impression surface [30]. In the present study, the custom acrylic tray which was coated with tray adhesive throughout the imprinting surface, may result in alterations to shrinkage in buccolingual direction. There was no change in mean values when the impressions were washed under tap water i.e., control group. The results of current investigation were in agreement with the study conducted by Ayesha AL and Shikh A [31] Demajo J et al., [32] and Egusa H and Watamoto T [33]. Based on this results it is better to pour the impression within 24 hours.

When the impressions were disinfected with 5% Glutaraldehyde (korsolex) no significant differences were noticed in mean die diameter and mean IAD. These results were similar to study conducted by Nassar U and Chow AK and Khan SA et al., where there was no change in mean diameter and IAD [34,35]. By this study, it has been showed that the VPS and VPES can be safely disinfected with korsolex for shorter time periods without affecting the properties of impression material. The literature also suggest that immersion method of disinfection is the gold standard method compared with that of spray disinfection [31]. This study showed that, there was no change in dimensional accuracy when the impressions were disinfected with korsolex up to 10 minutes. But some studies showed that longer immersion time (>10 mins) may affect the dimensional stability of the impression material [31]. In this study, VPES showed decrease in mean die height when impressions were poured after one week when compared to VPS (p=0.001). Previous studies also reported smaller vertical dimensions (die diameter) and larger horizontal dimensions (IAD) [36,37]. This might may be due to contraction of impression material towards the tray wall. When impressions were disinfected with korsolex, one step putty and light body impression technique showed mean die height values more accurate than that of two step impression technique. This might be due to displacement of putty during reseating of the impression during second stage which results in dimensional inaccuracy [17]. These results were similar to that of study conducted by Pandey A and Mehtra A [27] and Hung SH et al., [38]. The literature also suggest that impressions made with one stage putty and light body impression technique led to an accurate impression [39]. Even though the one stage putty and light body technique is simple less time consuming and cost effective it has several disadvantages [39]. The main drawbacks to this method were firstly, there was no bulk control at all. Moreover, in the majority of cases, putty material records some areas of the prepared teeth and margins where the light body gets displaced. Another drawback was that the during putty material setting, distortion is incorporated into the impressions as overall distortion because the putty and syringe materials were mixed at the same time. Even though this distortion was minimal it was better to eliminate [40]. Both the techniques had its own drawbacks and advantages. It is preferable to pour the cast within 24 hours, even though there were multiple studies that claim impressions can be kept and extended for up to two weeks unless and until if there was a need for delaying due to transport or if there was any need for accessory cast [41]. There might be loss of volatile components and distortion of impression which may effects the surface of impression on multiple pouring of the cast [42]. Comparative studies are shown in [Table/Fig-16]. According to results of the present study, the null hypothesis was rejected as there is a significant difference in dimensional stability between the impression materials and further research might be needed to understand the differences.

Author	Impression material	Impression technique	Chemical disinfection	Multiple pours	Dimensional stability
Johnson GH et al., 1988 [25]	VPS Poly Sulphide Polyether	-	Disinfection with neutral glutaraldehyde effects DS of VPS and Polysulphides	-	DS is affected with neutral glutaraldehyde disinfection where shorter dies were produced for VPS and Polysulphides (40µm)
Sergio G 2008 [17]	VPS	Monophase one step two step novel two step injection technique	-	-	The 2-step putty/light-body and 2-step injection techniques were the most dimensionally accurate impression methods in terms of resultant casts.
Pandey A and Mehtra A 2014 [27]	VPS poly ether VPES	-	-	-	Newely introduced VPES which is the hybrid product of VPES and PE yields good DS than VPS and polyether

Nassar U and Chow AK 2014 [34]	VPES VPS	-	Disinfected VPES and VPS samples showed considerably lower dimensional changes at 7 and 14 days compared to non-infected ones (p<0.0001). Regardless of whether they were disinfected, both materials' dimensional stability remained within the permitted limit of ANSI/ADA specification No. 19 for the course of the two week test.	Immediately 1 week 2 weeks	VPES showed low contraction during prolonged storage. However, surface detail scores were inconsistent compared to VPS. The material contracted the least when examined immediately following ingot production.
Garg S et al., 2019 [39]	(Aquasil and Virtual) VPS Brands	Monophase One step Two step	-	-	The two-step impression technique produced the most accurate results in terms of the resultant casts. Out of the two different brands, Aquasil produced more fare results.
Khan SA et al., 2020 [35]	Addition Silicone Condensation Silicone Polyethers	-	-	15 days	Polyether showed least dimensional change among the three materials. At 2, 3, 4, and 12 hours, there was a significant difference in mean dimension between addition and condensation silicone, but polyether exhibited no significant difference.
Present study	VPS VPES	One step Two step	Disinfection of VPS and VPES with korsolex and Surfasept.	1hr 24 hours 1 week 2 weeks	Disinfection of VPES with korsolex, showed decrease in mean die height when the impressions were made with two step impression technique and when casts poured at 2 week time interval. When VPS was disinfected with surfasept, the mean values of die diameter is decreased for casts poured at 1 week time interval.

[Table/Fig-16]: Table summarising the studies done type of impression material, technique, chemical disinfection and multiple pours influencing the dimensional stability of impression material [17,25,27,34,35,39].

Limitation(s)

The present study was an in-vitro study conducted at room temperature, which may differ from the oral environment. The lack of saliva exposure during impression-making may introduce variability, considering saliva's influence on material properties. Furthermore, the impressions were not subjected to microbial flora, an additional factor overlooked in the study. Thermal fluctuations during transportation another unaddressed variable could also affect the impressions characteristics. By accounting for these limitations, future research can better elucidate the factors that impact impression material performance, ultimately enhancing the accuracy and reliability of dental impressions in clinical settings.

CONCLUSION(S)

Within the limitations of the present study, the following conclusions were drawn. When the VPS and VPES impressions that were washed under tap water was examined there was no change in dimensional accuracy of die height, diameter and IAD in both the techniques when the impressions are poured up to one week. Upon disinfection of VPS and VPES impressions with korsolex and surfasept which were made with one stage and two stage technique there was increase in IAD after 2 week time interval. When VPS was disinfected with surfasept the mean values of die diameter was decreased after one week time interval. The dimensional stability of VPS is unaffected when subjected to korsolex. Upon disinfection of VPES with korsolex, the mean die height decreased when the impressions were made with two step impression technique and when casts were poured at 2 week time interval. There were very minimal studies conducted on effect of disinfectants on VPES material, in the present study, it affected the dimensions of the impression that were made with two stage impression technique when subjected to 5% glutaraldehyde suggestive of avoiding korsolex as disinfectant for VPES.

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